Systemic Approach to Wrong Way Driving Safety: **Effective Practices Brief**

AASHTO Innovation Initiative

FLORIDA DOT

Wrong way driving crashes occur randomly and less frequently than other crash types; however, they often involve multiple vehicles and result in multiple fatalities and/or serious injuries.

Many transportation agencies currently implement wrong way driver detection and deterrence tools and practices, but the variety of potential tools and practices vary, are often expensive, and are, in some cases, adopted as "spot treatments," typically at the corridor scale. The wide variety of tools and price factors are significant barriers to adoption, and disconnected implementation has a high potential for limited results.

Recent research has found that risk factors for wrong way driving do not limit themselves to high-volume corridors. A AAA Foundation for Traffic Safety's analysis of National Highway Traffic Safety Administration Fatality Analysis Reporting System (FARS) data for divided highways found that the following risk factors were associated to a greater degree with wrong way drivers than their right way driver counterparts:

- Imputed Blood Alcohol Content (BAC) – risk increases with BAC
- License status – risk increases for drivers with suspended or revoked licenses
- Driver's age – risk increases for those ages 70 and over
- Vehicle age (based on model year) – risk increases with the age of the vehicle

On average there are **432 deaths annually** from wrong way driving crashes on controlled-access highways (2010–2018).[1]

This is a **20% increase** over previously reported data from 2004–2009.[2]

[1] AAA Foundation for Traffic Safety
[2] National Transportation Safety Board

Further, wrong way driving is not limited to divided highways or freeways and should be considered along prioritized arterials where wrong way driving crashes occur more frequently (though with a lower risk of fatality due to slower travel speeds).

THE SYSTEMIC APPROACH

A systemic approach to wrong way driving considers an agency's entire roadway system. The approach holistically applies proven methods, physical improvements, and technologies to mitigate wrong way driving. These countermeasures can integrate into existing approaches and programs for safety and help achieve agency safety objectives.

Recent agency experience among four states (California, Florida, Iowa, and Michigan) highlights a range of proven and emerging countermeasures that respond to different roadway characteristics (such as interchange type) as well as demographic and land use factors. Many of these treatments are low-cost countermeasures, and readily implemented without substantial investment in technology.

Though infrequent, wrong way driving crashes come at high costs from serious injuries and fatalities. Reducing these crashes through a systemic approach to wrong way driving countermeasures can yield highly cost-effective safety benefits, and agencies can learn from and adopt the practices of states leading a systemic approach to wrong way driving. This brief focuses on the effective practices of Florida DOT.

Why the Focus?

In continually seeking to improve the safety of its roadway network, Florida DOT (FDOT) conducted a statewide study of crash data from 2012 to 2016 and identified 1,890 wrong way driving crashes on the state highway system's arterials and over 250 such crashes on freeways. Additional studies and pilot projects expanded FDOT's understanding of the problem and informed the selection of effective countermeasures for both freeways and arterials.

Approach Taken

During the statewide study of crash data, in 2014, FDOT evaluated locations that would benefit from wrong way driving countermeasure deployment. FDOT deployed and assessed static signs and pavement markings; red in-roadway warning lights on exit ramps; red rectangular rapid flashing beacons (RRFB); and dynamic driver-alerting including LED-highlighted wrong-way signs with detection technologies and communication to a Regional Traffic Management Center (RTMC). Concurrently, FDOT developed and incorporated a wrong way driving response module into its SunGuide® platform for traffic management.

FDOT also conducted research studies. A statewide study of signing and pavement marking (S&PM) identified some that could potentially reduce wrong-way entries, while a human-factor study investigated the effectiveness of the S&PM in a simulation environment. Another study compared the effectiveness of seven wrong way driving countermeasures that were deployed among various pilot projects. A comprehensive data driven study identified and ranked 520 wrong way driving hotspots for countermeasure deployment based on wrong way driving crash data and other factors including impaired drivers, drivers aged 65 years and older, and tourists.

Ultimately, FDOT concluded that the LED-highlighted WRONG WAY sign is one of the most effective countermeasures to warn a wrong-way entering motorist and send alerts to the RTMC via a Wrong Way Vehicle Detection System (WWVDS). This enables the RTMC operators to quickly coordinate with law enforcement for dispatch and interception, and to activate dynamic message signs (DMS) to warn the right-way motorists to the presence of a wrong way driver. Further, the S&PM studies identified additional, enhanced S&PM for deployment throughout state at all exit ramps.

A Wrong Way Driving Countermeasure Implementation Plan guides the statewide deployment of the LED-highlighted WRONG WAY signs, which began in 2019 with a $15 million initial allocation for this priority deployment. As of early 2023, a significant number of the 520 off-ramps are operational with both enhanced S&PM and a gradually increasing number of WWVDS.

To address wrong way driving crashes on arterials, FDOT conducted a statewide study to identify arterial hotspots and develop a set of countermeasures for various arterial roadway geometry. The study identified how one or more roadway geometric and demographic factors contributed to wrong way driving crashes, including one-way streets, signalized intersections, stop-controlled intersections, absence of wrong way driving signs, impaired drivers, and/or elderly drivers. The study also identified critical signalized and stop-controlled intersections along all state roads within each of the hotspots.

Outcomes and Benefits

Data collected relating specifically to deployment of LED-highlighted WRONG WAY signs with WWVDS on 35 turnpike exit ramps between October 2014 and March 2021 indicated 159 confirmed cases of wrong way entry of which 155 (98%) turned around (self-corrected) after activation of the signs.

FDOT updated the Florida Design Manual (FDM) to incorporate higher standards (relative to the MUTCD) for wrong way driving S&PM for freeway and arterial exit ramps. In addition, FDOT has incorporated the wrong way driving countermeasures into other standardized processes.

RESOURCES

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Approved Product List for WWVDS vendors